REPORT NO. 41

EDUCATIVE NEWSLETTER

A Master Antenna System for Your School A Do-It Yourself Project . . .

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Institutions located reasonably close to television stations can generally rely upon antennas usually built into the receivers to provide adequate signal strength pickup. In some instances it may be necessary to substitute a higher-gain indoor antenna, placed on top of the set. Where this latter does not suffice, and where more than a single television set is to be used in a building, a master antenna system provides the best solution.

Erecting an outdoor antenna for each television receiver in use in a single structure is impractical too for several reasons. It results in a maze of masts, guy wires, and lead-ins; a fire hazard, as well as an eyesore. Roof space adequate for separate installations is usually not available. TV sets sometimes transmit signals of their own from their antennas that can seriously interfere with other receivers having their antennas nearby. And since not all rooftop positions are equally effective as antenna locations, reception on some sets would be poorer than others. For these and other good reasons new building projects should provide for utilization of a master antenna. Plans should include specifications for a coaxial cable conduit system, with outlets in each classroom, auditorium, study hall, or other room where it is reasonable to expect televiewing activities.

Students Erecting Outdoor Antenna as a Do-It-Yourself Project

Obviously, existing buildings not so equipped constitute an immediate major problem. It is in this area that these practical suggestions specifically apply.

Master Antenna Distribution System

Every television receiver requires a certain level of signal energy from the antenna to permit it to function properly and convert this stimulus into distinguishable images. An antenna source capable of supplying many times the necessary threshold signal level for a single set could be channeled or distributed to a number of receivers, each utilizing its necessary portion of the signal output. This is the principle underlying the master antenna approach. The distribution arrangement is similar to the conventional power wiring setup in which plug-in outlets are available in all strategic room locations.

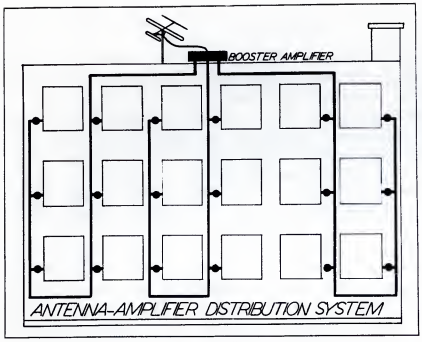
Two distinct adaptations of this system are in current use. The first is an outdoor antenna oriented for the most efficient pickup of the stations involved, and connected to an electronic amplifier (see illustration). In this way the signal strength can be raised to any reasonable level. From this central amplifier location, cables are run to outlets in the various viewing rooms. This setup gives optimum results; but it is comparatively costly, requires proportionately greater maintenance, and must be powered by the regular lighting circuit during the hours that the school is in operation. The installation and engineering of this type of master antenna is relatively complex, and may be somewhat beyond the endeavors of the novice.

The alternate system is a feasible approach to the problem. It requires less expense to maintain and operate and is much more simple to install. First, it is necessary to install a high-gain television antenna on the roof or atop a mast. (See illustration) Generally, the higher the antenna, the stronger the pickup. Where a reasonably good signal is obtainable the operation of four receivers from a single antenna is practical. It is recommended that a stacked array (several separate antennas connected together on the same mast) be employed for increased pickup if the location can supply only a moderate signal.

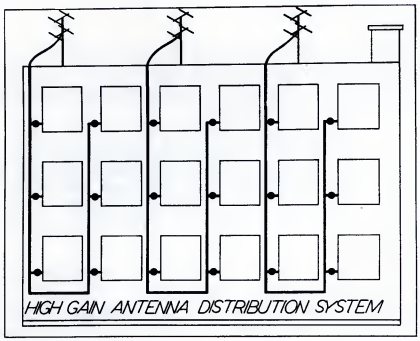
In the event that the signal strength level in a particular location is not enough to drive as many receivers as desired, it is then necessary to install a second antenna with its own lead-in and distribution system. Thus, a school with three separate antennas can operate several television receivers simultaneously from each antenna. Although more antennas are involved than with the system employing the electronic amplifier, this may still result in a saving in cost.

Installation Procedures

A practical way of locating and orienting a television antenna on a school roof, when special test equipment is not available, is to bring a small television receiver up on the roof, and connect it as for normal operation. It will be necessary to furnish a power extension cord to the receiver site. The cord can be plugged into an outlet on the top floor and drawn through a skylight or an open window. After hooking up the test set with a long lead-in from the antenna, raise the antenna in the air on a 10-foot pipe held in the hands. With this arrangement the mobile antenna is "walked" to various locations on the roof. Some areas will prove much more effective than others



Antenna Amplifier
Distribution System



High Gain Antenna
Distribution System

for reception pickup due to the location of metal masses, pipes, masonry obstructions, and the like. In this way picture quality is compared in the various sections and at different heights above the roof. When the best position is determined, the permanent mast is installed, and final orientation is accomplished by using the test TV receiver again. Proper orientation helps to provide ghost-free images.

Antenna masts should be grounded as a safeguard against lightning hazards. Local electrical codes are to be strictly adhered to in such instances. If the installers are not familiar with the code, copies should be obtained and studied.

Where the mast is not rigidly self-supporting, it is necessary to install guy wires for anchoring purposes. These are usually iron

wires connected to rings or other projections affixed to the mast at different levels. In some cases these wires may be resonant to the antenna wavelength, and cause signal absorption or reflection. In such instances the lengths of these runs must be broken up by the insertion of insulators. Extreme care should be used in installing and locating the antenna mast and the guide wires to eliminate any danger of their coming in contact with power lines. Now it is time to attach the coaxial cable to the antenna making a reasonable attempt to match the antenna impedance to that of the line. It is desirable, of course, to run the coaxial cable from the antenna to the outlets through the interior of the building. This however, is both time consuming and expensive. It requires drilling, fishing lines, and defacing wall and woodwork areas. A simpler alternative is to run the coaxial cable on the outside of the building to a point as centrally located as possible with respect to the receivers which are to be served by this particular antenna. At this point an "H" pad designed to match the single line from the antenna to the collective input impedance of the receivers to be supplied must be inserted. If this pad is exposed to the weather it must, of course, be protected against damage by rain. From the set side of the matching pad, cables are then run to each individual set. It would of course be desirable to make checks to determine how many receivers can be operated efficiently from the single antenna by making temporary hookups before the final installation is made.

The lines should be anchored often so that they will not sway in the wind, and unsupported runs should not be over a foot in length. A great variety of fasteners for both masonry and wood are available, and can be adapted to any situation.

The matching pads mentioned vary in design and quality and may be obtained in commercially built versions or may be built by the school itself if proper care in obtaining accurate data and good materials is used. With the development of the solderless connectors for coaxial cable, junctions, splices, and other transmission arrangements are simply accomplished.

If your school has but a single receiver, it is still an excellent idea to consider a master antenna installation. With this approach, the antenna and lead-in distribution system is installed in as many rooms as are planned for TV viewing. When later on additional receivers are obtained, the correct matching pads can be constructed and installed, as the rooms are put into service. Another approach is to mount a single receiver on a mobile stand (see EducaTiVe Newsletters numbers 44 and 45). The set can be rolled from room to room and plugged into the antenna outlets thus provided, assuming that a temporary matching pad has been installed at the junction of the antenna lead in and the branches.

Institutions planning to make the installations described should be certain that they are close enough to the transmitting stations for adequate signal pickup.

The chief advantage of this system is lower cost but it should not be considered a substitute for the electronic type of distribution system where cost is not a factor.

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